NATURE

A WEEKLY ILLUSTRATED JOURNAL OF SCIENCE.

"To the solid ground
Of Nature trusts the mind which builds for aye."—WORDSWORTH.

THURSDAY, MARCH 3, 1910.

AN ENCYCLOPÆDIC TREATISE ON THE PROTOZOA.

Lehrbuch der Protozoenkunde. Zweite Auflage der "Protozoen als Parasiten und Krankheitserreger." By Dr. F. Doflein. Pp. x+914; 825 figures. (Jena: Gustav Fischer, 1909.) Price 24 marks (unbound).

THE study of the Protozoa has made very great progress during the last twenty years, so great that even those who devote themselves to this branch of knowledge have the utmost difficulty in keeping pace with its rapid advance. This state of things is due chiefly to the great practical importance of the Protozoa for medical, veterinary, and agricultural science, but also because the primitive forms of life give the clue to many biological problems of fundamental importance. Hence the number of those who occupy themselves with researches upon Protozoa has very much increased, both amongst professed zoologists and also amongst those to whom zoological questions are a secondary consideration; all such workers, however, whatever their aims, will welcome the publication of Prof. Doflein's treatise. This work is ostensibly the second edition of his well-known manual on the Protozoa as parasites and causes of disease, a most useful book in its time, though now left behind by the flowing tide of research; its parentage, however, is scarcely recognisable, since the second edition appears with new title, changed form, and greatly enlarged scope. The treatment of parasites and disease, though not neglected, takes a secondary place, and the work has become an exhaustive general treatise on the Protozoa.

It is difficult, within the limits of space imposed upon a reviewer, to give an adequate account of the wealth of facts, ideas, and illustrations contained in the 900 or so pages of this book. The work is divided into two halves, the first containing a general account of the natural history of the Protozoa, the second a more detailed systematic description of the groups of Protozoa and of the special problems connected with them.

The general part begins with a short introduction giving the definition and distinctive characters of the Protozoa, and is then subdivided under the headings morphology, physiology, reproduction, biology (or bionomics), system, and technique. The Protozoa are regarded as unicellular organisms occupying a middle position between the Bacteria and their allies below and the Metazoa above. As regards the structure of protoplasm, the author is a strong adherent of the alveolar theory of Bütschli. The nucleus of Protozoa is described in detail, both as regards constitution and morphology, and special sections are devoted to chromidia, centrosomes, and blepharoplasts; we miss, however, any discussion of the binuclear hypothesis of the cell, put forward by Hartmann and Prowazek, in relation to the theory of the centrosome. The term "blepharoplast" is applied by the author to the kinetonucleus of trypanosomes, as is usual in Germany; we must confess to a feeling of surprise, however, that the author doubts the nuclear nature of this body.

The section on physiology is subdivided under the headings "Stoffwechsel" and "Kraftwechsel." The section on reproduction deals with fission, fertilisation, form and development, the Protozoa as unicellular organisms, and theoretical problems of sex and reproduction. Under the fifth of these headings the author discusses the hypothesis of nuclear dualism (more correctly dualism of the chromatin-substance) of the protozoan organism put forward by Schaudinn and Goldschmidt; according to this view, every protozoon is be regarded as containing two nuclei (or rather two kinds of chromatin), a "Stoffwechselkern" of vegetative somatochromatin, and a "Geschlechtskern" of generative idiochromatin. The author considers (and we fully agree) that there are not two distinct kinds of nuclear substance, but that one and the same substance is responsible both for functional activity and for heredity in the protozoan body; he quotes Hertwig's opinion in support of his own, to the effect that somatochromatin is idiochromatin of which the activities are awakened, and idiochromatin is somatochromatin in which the activity is dormant but can be renewed under suitable conditions. He considers,

further, that many substances, which have been mistaken for chromatin on account of their affinity for stains, are in reality reserve materials, precipitation-products, and the like, and that this confusion of chromatin with other substances has often led to the erroneous distinction of two kinds of chromatin.

In discussing the theoretical aspects of reproduction and fertilisation, the author states and reviews in a very clear and interesting manner the various theories that have been put forward, especially those of Weismann, Bütschli, Hertwig, and Schaudinn, and ends by sketching in brief outline a theory of his own. Living cells are regarded as consisting principally of two groups of vitally-active substances, the one, more fluid, responsible for motor phenomena, the other, more viscid, regulating metabolic cell-functions. In cell-reproduction by fission these substances are never distributed with mathematical equality amongst the descendants, hence continued division brings about accumulations of different properties in certain individuals, with, as a consequence, impaired vital activity and reproductive power. Individuals are produced, some of which become richer in reserve material (female), others in motile substance (male). Since these two kinds of individuals contain aggregations of substances which have intense mutual chemical reactions, they exert an attraction one towards the other; the two individuals tend to unite as gametes, and by their union cell-equilibrium is restored and vital powers renewed. Hence fertilisation is regarded as a necessity for the life-cycle, due primarily to the imperfections of cell-division and to the consequent loss of equilibrium in the cell-constituents, a view which unites and extends the theories of Schaudinn and Hertwig respectively.

The section dealing with the bionomics of the Protozoa is divided into the following subsections:—occurrence and distribution, habit and mode of life, adaptation of the methods of nutrition, adaptations of the reproductive processes and means of dispersal, influence of the medium, light and rays, temperature and climate. Under the heading "System," the various classifications that have been put forward are discussed. The Protozoa are classified into two main divisions, first, the Plasmodroma, including the Rhizopoda, Mastigophora, and Sporozoa; and, secondly, the Ciliophora, including the Ciliata and Suctoria. The Spirochætes are regarded as leading from the organisms of bacterial nature to Mastigophora, and hence, for the first time, we believe, in a treatise on Protozoa, the Mastigophora are dealt with before the Rhizopoda.

The section on technique is a brief summary of methods of cultivating, investigating, and preserving Protozoa.

The special part of the work is a detailed description, in systematic order, of the structure and life-histories of the orders, families, and more important genera and species of Protozoa. Intercalated amongst the systematic descriptions are sections dealing with the parasitic and pathogenic importance of certain groups, namely, the Spirochætes, Flagellates, Amœbæ, and Telosporidia. In these sections the diseases produced by the Protozoa in question, and their pathology and etiology, are discussed, with figures and descriptions of the blood-sucking invertebrates which are responsible for their dissemination. From all this wealth of material we must be content to note a few points concerning debated questions. The theory of an alternation of sexual and non-sexual generations in trypanosomes, comparable to the alternating cycles of Hæmosporidia, is regarded as purely hypothetical and in need of proof. The author considers that it will probably be necessary in the future to place the genus Trypanosoma in the family Cercomonadidæ, in close proximity to Herpetomonas and Crithidia; on the other hand, Trypanoplasma is placed in a separate family, Bodonidæ. Schaudinn's statements with regard to the relationship of Trypanosoma to Hæmoproteus and Leucocytozoon are set forth in detail, together with the criticisms and objections of Novy, MacNeal, and others; judgment is suspended until more exact information shall have been obtained, but Hartmann's union of Hæmosporidia and Trypanosomes into one group, the Binucleata, is not accepted. The genus Hæmoproteus (Halteridium) is dealt with in an appendix to the Hæmosporidia, together with Babesia, Endotrypanum, and Leishmania; it will be a surprise to most protozoologists to meet with Leishmania in this company, and we are decidedly of opinion that its proper position is in the neighbourhood of Herpetomonas.

In the class Rhizopoda the forms with lobose pseudopodia and a shell are placed with the monothalamous Foraminifera, so that this order can no longer be defined by the reticulose nature of its pseudopodia. The Protomyxidea, including the genera Vampyrella, Pseudospora, Chlamydomyxa, and Labyrinthula, are placed as an appendix of uncertain position at the end of the Rhizopoda.

The Telosporidia are subdivided into Gregarinidæ and Coccidiomorpha; the second of these divisions includes the Coccidia and the Hæmosporidia, which are divided into Plasmodidæ and Hæmogregarinidæ. We regret to see the familiar generic name Coccidium replaced by Eimeria; this is one of those many cases where, in our opinion, rebellion against the law of priority in nomenclature is not only lawful but imperative.

The feeling aroused by even a cursory scrutiny of this book is one of dismay at the vast extent to which the subject has grown, astonishment at the erudition of the author, and gratitude to him for his painstaking diligence in putting together such a store of important facts and so useful a guide to the intricacies of the subject. It would not be difficult, perhaps, to point out parts of the book here and there in which certain subjects or groups have not been so well treated as others; the Hæmogregarines, for instance, are not dealt with very adequately. But a treatise of this size, on which the carping critic would be perforce silent, could hardly have been written by a human being, or even by several. It is seldom that so great a work is completed by one man at the present time. A striking feature of the book is the number of beautiful illustrations, and especially of previously unpublished figures, some by the author and some by other investigators; in particular we

would direct attention to many figures reproduced from those left behind by the late Dr. Fritz Schaudinn, which will be of the greatest interest to all protozoologists.

In conclusion, we have no hesitation in recommending this work to all those who wish to possess an admirable and exhaustive treatise on the Protozoa.

E. A. MINCHIN.

THE EARLY HISTORY OF NEW ZEALAND. Murihiku, a History of the South Island of New Zealand and the Islands adjacent and lying to the South, from 1642 to 1835. By Robert McNab. Pp. xv+499; with plates and charts. (Wellington, N.Z.: Whitcombe and Tombs, Ltd., 1909.)

THOSE who are personally acquainted with that prosperous and very up-to-date portion of His Majesty's Empire now known as the Dominion of New Zealand will find it difficult to realise that so recently as the year 1835 the Customs House authorities in London decided that whale oil imported from that country was liable to a duty of 26*l.* 12*s.* per tun, on the ground that it did not come from a British possession. So many stirring events, however, had already taken place in New Zealand at this date that it has required eleven years of research to enable Mr. McNab to recover from the "forgotten past" the materials for a history of the southern portion of the Dominion from the time of its discovery by Tasman in 1642 up to the year mentioned. The task has been an arduous one, involving the close study of rare works in English, Spanish, French, and Russian, and the examination of countless official documents and files of local newspapers. Information has been brought together from every quarter of the globe, and not the least interesting of the author's discoveries is that of a series of manuscript logs of early voyages, which he found in the library of the Essex Institute at Salem, Massachusetts.

The classical explorations of Tasman, Cook, and Vancouver are already familiar to students of history, but the details of Bellingshausen's visit have hitherto been almost unknown to English readers. He commanded a Russian expedition which reached New Zealand in 1820. The narrative of the voyage, published in Russian, is now very rare. An abridged translation was published in German in 1904, and Mr. McNab has included in the present volume an English translation of the portions relating to New Zealand, the most interesting of which is a graphic account of the sea-elephant fishery which then flourished in Macquarie Island.

In the early part of the nineteenth century New Zealand and the adjacent islands were a kind of no-man's-land, and a happy hunting-ground for sealers and whalers from Australia and America. The records of these early trading expeditions, culled largely from the shipping reports and correspondence columns of the Sydney newspapers, contain much of thrilling adventure. The men must have been made of stern stuff who would consent to be left behind in small sealing gangs on an almost unknown coast, exposed to the attacks of the cannibal Maoris—attacks which were sometimes very successful—and with scanty supplies, while their ship continued her explorations, to call for them and their sealskins at some future date, often many months later. Sydney formed the headquarters of most of these expeditions. It was then a convict settlement, and we are told that Governor Phillip actually asked the English authorities for special powers to deport condemned men to New Zealand to be handed over as food for the natives!

The compilation of this work has evidently been a labour of love, but the author has none the less earned our gratitude by the manner in which he has fulfilled his task. Ethnologists and naturalists will both find a good deal to interest them in the book, but it is as a piece of historical research that it must be judged, and we expect that the writer of historical romance, as well as the more serious student of history, will profit largely by it in years to come.

A. D.

CHEMICAL CONTROL OF FOODSTUFFS. Food Inspection and Analysis. For the use of Public Analysts, Health Officers, Sanitary Chemists, and Food Economists. By Albert E. Leach. Pp. xviii+954+xl plates. Second edition, revised and enlarged. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1909.) Price 31*s.* 6*d.* net.

THIS work, the first edition of which was reviewed in these columns some four years ago (NATURE, November 17, 1904, p. 57), is favourably known in this country as a very useful aid in the analysis of foodstuffs. For the information of readers interested in this subject and hitherto unacquainted with the volume, we may mention that it aims at giving, in a compass of about a thousand pages, a short description of the origin and composition of all the chief foods, condiments, and alcoholic beverages; together with a selection of the most approved methods for their chemical and physical examination.

General laboratory equipment is dealt with, and there are sections devoted to special apparatus, such as the microscope, camera, tintometer, refractometer, and polarimeter. Numerous tables of analytical constants are provided, as well as many illustrations of microscopical structure; in fact, the idea appears to be to make the book so far as possible self-sufficient for all ordinary work. The convenience of this is obvious; the essential information, enabling routine samples to be disposed of, is collected in one volume instead of being scattered over half-a-dozen. For assistance in dealing with special cases, where fuller details are necessary, a long list of references is appended to each chapter.

The new matter in the second edition runs to some 167 pages. A notable extension is made in the chapter devoted to cereals. Here we remark the inclusion of such matters as the use of pancreatin for starch-converting purposes alternatively to malt extract; a table (Kröber's) for determining pentoses and pentosans from the amount of phloroglucide; a scheme for complete ash-analysis, and sections dealing with the bleaching and examination of flour. These last, in addition to the usual methods for determining the proportions of gluten, gliadin, and other proximate